RadioShack®

2200813
User's Guide

29-Range Digital Multimeter

Thank you for purchasing your 29-Range Digital Multimeter from ***RadioShack***. Please read this user's guide before installing, setting up, and using your new multimeter.

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Package Contents

- 29-Range Digital Multimeter
- Spare Fuse (in the case)
- Test Leads (2)
- User's Guide

Features

- Measures voltage, current and resistance
- Auto-ranging with manual-ranging override
- Diode test

Care and Service

- Keep your meter dry and clean. If it gets wet or dirty, wipe it dry or clean immediately with a cloth lightly dampened with water. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the meter.
- Use and store the meter in normal temperature environments only. Handle your meter carefully. Do not drop it.
- Modifying or tampering the meter's internal components can cause malfunction and might invalidate its warranty. If your meter is not performing as it should, take it to your local ***RadioShack*** store for assistance.

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Safety Precautions

- Do not use the meter if you are unfamiliar with electric circuits and testing procedures.
- To avoid electric shock, disconnect both test leads from the circuit under test before you replace the batteries and fuse.
- Do not operate the meter until the batteries are properly installed and the back cover and battery compartment cover are in place and secured.
- Use extreme caution when working with voltages above 30V RMS and 42.4V peak or 60V DC. Always disconnect power from the circuit you are measuring before you connect test leads to high-voltage points.
- Never connect to a voltage source when you select the diode check, continuity function, resistance measurement, or any of the battery test or current measurement functions.
- Always discharge any capacitors of the circuit under test before you attach test leads and always turn off power and disconnect the test leads from the circuit before replacing the meter's batteries or the fuse.
- Because many AC/DC sets have a potentially hot chassis, be sure the top of your workbench and the floor underneath it are made of nonconductive materials.
- If you connect one test lead to a hot wire first and touch the other test lead tip, you could receive an electric shock.

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- The test leads (black and red) supplied with your meter are rated for 1000 volts but do not try to measure any voltage greater than 600 volts DC/600 volts RMS AC. Use only test leads of the same rating as the meter.
- Your multimeter is designed primarily to measure household AC voltages. Because of the dangers inherent in measuring three-phase circuits, WE STRONGLY RECOMMEND YOU DO NOT USE THIS METER TO MEASURE 3-PHASE, LINE-TO-LINE VOLTAGE. If you still want to, put on protective clothing – a face shield and fireproof gloves and upper body protection is required before measuring. If you do not have this protection, DO NOT MEASURE THESE CIRCUITS.
- To reduce the risk of fire or shock hazard, do not expose this product to rain or moisture. For indoor use only.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- For the most accurate reading, the temperature should be between 65°F and 83°F (18°C to 28°C), with a maximum of 75% relative humidity.

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AUTO – Auto range mode.

Bar Graph Display – 8 segments represent units for the selected function.

Range – Press to select ranges.

SELECT – Toggle measurement options within a function.

HOLD – Press to hold all indications on the display.

Function/Power dial

Turn the meter on/off or select the type of measurement:

- **V⎓≅** – Measures DC/AC voltage.
- **mA/A⎓≅** – Measures amperage: DC 40/400 mA and AC 40/400 mA; DC 4/10 A and AC 4/10 A
- **⊣◀ Ω** – Measures resistance and checks continuity/diodes.
- **AA/C/D**, **AAA**, **9V** – Test specific battery types.

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Special Panel Markings

600V ⎓ ⎓ MAX ⏚	The maximum voltage that this meter can measure is 600V RMS AC or 600V DC. To avoid electric shock and damage to the meter, do not connect the two input terminals (**-COM** and **+V**.Ω.**mA**) to any source that exceeds 600 volts with respect to ground.
400mA MAX	The maximum current that this meter can measure at this jack is 400mA DC or AC.
	Caution: RISK OF ELECTRIC SHOCK! Refer to the complete operating instructions.
	Caution: Be extremely careful when taking high-voltage measurements. DO NOT TOUCH TERMINALS OR TEST LEAD ENDS.
CAT II	This equipment is rated for installation category II (3600 VA max.).
10A MAX. UNFUSED	The maximum current you can measure at this jack is 10 amps DC/AC. This jack is not fuse-protected.
⧈	The meter is protected by double insulation.

Note: *The UL mark does not indicate that this product has been evaluated by Underwriters Laboratories for the accuracy of its readings.*

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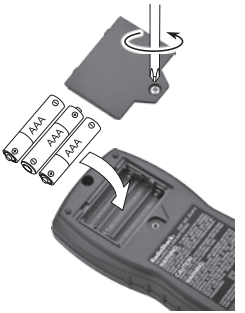
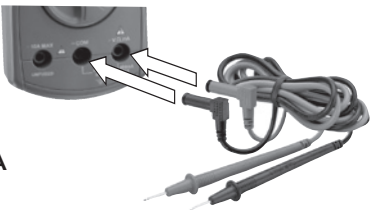
Install the Batteries



Before installing batteries, turn off the multimeter and disconnect the test leads. Install three AAA batteries (not included), matching the polarity symbols (+ and -) marked inside. When ⌰ appears, replace the batteries.

- *Dispose of batteries promptly and properly. Do not burn or bury them.*
- *Use only fresh batteries of the required size and type.*
- *If you do not plan to use the meter for a month or more, remove the batteries. Batteries can leak chemicals that can damage electronic parts.*

Connect the Test Leads



1. Remove the rubber caps from the test leads.
2. Plug the black lead into the **–COM** jack and the red lead into the **+V.Ω.mA** jack. To measure current greater than 400mA, plug the red test lead into **+10A MAX**.

Note: *After connecting to the **+10A MAX** jack to measure anything except current, a buzzer reminds you not to touch the test leads to the circuit.*

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Basic Operation

Selecting Ranges

Set the meter to a measurement range; the unit of measure appears on the display. For example, *mV* appears in the 400 mV range.

Note the position of the decimal:

- If 0.000V appears, the meter is set to measure less than 4 volts.
- If 000 V appears, the meter is set to measure up to 600 volts.

Read the range in volts, amps, or ohms as indicated by the position of the decimal point.

Range	Display
400 mV	*ddd.d mV*
4 V	*d.ddd V*
40 V	*dd.dd V*
400 V	*ddd.d V*
600 V	*ddd V*
40 mA	*dd.dd mA*
400 mA	*ddd.d mA*
4 A	*d.ddd A*
10 A	*dd.dd A*
400 Ω	*ddd.d Ω*
4 kΩ	*d.ddd kΩ*
40 kΩ	*dd.dd kΩ*
400 kΩ	*ddd.d kΩ*
4 MΩ	*d.ddd MΩ*
40 MΩ	*dd.dd MΩ*
"*d*" denotes any digit from 0 to 9.	

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⚠ ***Caution:*** *If you are measuring voltage or current when* OF *(overflow) appears, immediately disconnect the test leads from the circuit.*

Measuring DC/AC Voltage

DO NOT try to measure voltages above 600 V DC/AC (RMS).

⚠ ***Warning:*** *When measuring high-voltage circuits, do not position both test leads at once. Connect the black test lead first to the circuit's neutral or ground lead. Then, using one hand, probe for voltages with the other test lead. This helps prevent accidentally touching a hot wire.*

1. Set the function dial to **V**⎓≅.
2. Press **SELECT** to select DC or AC. ∼ appears for AC voltage measurement.
3. Touch the black test lead to the circuit.
4. Touch the red test lead to the circuit.

If the meter is set to the 400mV DC manual range and you measure an overrange input, OF continues to appear even after you remove the input. Touch the test leads together or change the meter's setting to clear OF.

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Measuring AC Voltage Riding on a DC Source Bias

Warning: *To avoid injury or damage to your meter, never try to measure an AC voltage on a DC source bias where the peak AC voltage exceeds 100V with respect to earth ground.*

1. Set the function dial to **V⎓** (DC voltage). Measure the DC voltage first to ensure that it does not exceed 100V.
2. Disconnect power from the circuit.
3. Press **SELECT** (AC mode). ~ appears.
4. Connect the black test lead to the circuit's neutral/ground lead.
5. Connect a 0.1 microfarad/100V mylar capacitor in series with the voltage source's positive terminal and the red test lead.
6. Restore circuit power and read the voltage.
7. Power off the circuit; then disconnect the capacitor.

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Measuring DC/AC Current

1. Disconnect power from the circuit and discharge all capacitors.
2. Rotate the function dial to **mA/A⎓≂**.
3. Press **SELECT** to select DC or AC. ~ appears for AC current measurement.
4. Break the circuit and connect the black test lead to one of the two connection points.
5. Plug the red test lead into **+ 10A MAX**. To measure current less than 400mA, plug the red test lead to **+V**.Ω.**mA** jack. Do NOT measure current greater than 10A.
6. Connect the red test lead to the connection point on the broken circuit.
7. Power the circuit and read the results.

Note:

- *The* **+V.Ω.mA** *jack is is fuse-protected. If the meter cannot measure in 40/400mA ranges, check and replace the fuse.*
- *If the current's polarity is negative,* **–** *appears before the value.*

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Measuring Resistance

1. Disconnect power from the circuit and discharge all capacitors.
2. Rotate the function dial to ⊣◀)) Ω.
3. Repeatedly press **SELECT** to select Ω, KΩ, or MΩ.
4. Connect the black test lead to one component lead.
5. Connect the red test lead to the other component lead, or remove one component lead from its circuit and touch the test leads across the component.

***Note**:*

- *If no resistance is connected across the test leads (meaning resistance is infinite), or of the value under test exceeds the range you set, 0.F appears. This is normal.*
- *If you are measuring resistance of about 1MΩ or more, the display might take a few seconds to stabilize. This is normal.*

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Checking Continuity

You can check for shorted or open electrical circuits.

1. Disconnect power from the circuit and discharge all capacitors.
2. Rotate the function dial to ⊣◀ Ω.
3. Repeatedly press **SELECT** until ◀ appears.
4. Connect the black test lead to one end of the circuit and the red lead to the other end.

- *Open* appears if the circuit resistance is greater than about 80 ohms (meaning the circuit is not shorted).
- *Shrt* appears and the buzzer sounds if the circuit resistance is less than about 80 ohms (meaning the circuit has low ohmage or is shorted).

Checking Diodes

You can check diodes, transistors, and other semiconductors for opens, shorts, and normal operation. You can also determine the forward voltage and polarity for diodes and check diode polarity when positive (+) and negative (–) sides are not marked.

1. Disconnect power from the circuit and discharge all capacitors.
2. Rotate the function dial to ⊣◀ Ω.

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3. Press **SELECT** until ⊣◀ appears.
4. Connect the black test lead to the cathode or a component pin.
5. Connect the red test lead to the anode or the other component pin, or remove one of the leads of the component from its circuit and touch the test leads across the component. Then note the first reading.
6. Reverse the test leads and note the second reading.

- If one reading shows a value and the other is overrange (.OF appears), the device is good.
- If OF appears during both readings, the device is open.
- If both values are very small or zero, the device is shorted.

Note:

- *The values for most semiconductors may vary depending on the temperature.*
- *The values that appear during a diode check show the actual forward voltage (max. 1.2V). If the voltage exceeds 1.2V, 0.F appears. This means the diode check cannot be made using this meter.*
- ***Check diode polarity:** Connect the test leads to the two ends of the diode. Measure and note the voltage. Then, reverse the test leads. The end with the red test lead when you get the higher voltage reading is the positive (+) side.*

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Checking Batteries

The meter can accurately check the following batteries under designated load conditions:

- 1.5V C
- D
- AA
- AAA
- 9V batteries.

1. Rotate the function dial to your desired setting.
2. Connect the black test lead to the battery's negative (–) terminal
3. Connect the red test lead to the battery's positive (+) terminal.

- If you connect the test leads in reverse polarity, **–** appears on the left side of the display. Use this table to determine the battery's charge.

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Battery	Range	Display	Action
AAA/AA/C/D	< 0.010 volts	No value appears.	Replace the battery.
9V	< 0.10 volts		
AAA/AA/C/D	< 1 volt	Voltage and **Bad** appear.	
9V	< 6 volts		
AAA/AA/C/D	1 – 1.1 volts	Voltage appears and **Good** flashes.	Consider replacing the battery.
9V	6 - 6.6 volts		
AAA/AA/C/D	1.1 – 1.5 volts	Voltage and **Good** appear.	The battery is good.
9V	6.6 - 9 volts		
AAA/AA/C/D	> 1.5 volts	Voltage and **Good** appear.	The battery is full.
9V	> 9 volts		
AAA/AA/C/D	> 2 volts	.OF appears	
9V	> 11 volts		

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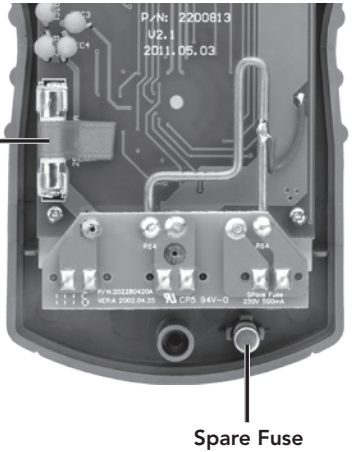
Additional Information

Replacing the Fuse



If the meter does not operate, you might need to replace the fuse with the supplied spare fuse. The meter contains a 5 × 20mm, 500mA, 250V ceramic fuse.

1. Turn off the meter and disconnect the test leads.
2. Use a Phillips screwdriver to open the back cover of the meter.
3. Gently pull the red ribbon wrapped around the fuse to pop it out.
4. If the fuse is blown, discard it and save the red ribbon. Place the supplied spare fuse into the ribbon, and insert the fuse into the fuse holder.
5. Replace the back cover.

***Note**: Do not use a fuse brand or rating other than the one specified here. Doing so might damage your meter.*

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Auto Power Off

Your meter conserves power by automatically turning off about 30 minutes after the last time you changed a setting (even if you are taking measurements). The meter beeps before it turns off. Press any button or select another function to turn it on.

To set the meter so that it does not turn off automatically, press and hold **HOLD** and **SELECT** at the same time, as you turn on the meter. *PLoc* appears. When you release **HOLD** and **SELECT**. *PLoc* disappears and PWR Lock appears.

To reactivate the meter's automatic power saving function, turn off the meter then turn it on. PWR Lock disappears.

Testing the Display

To test the meter's display, hold down any button while turning on the meter. All segments appear on the display. Release the button to end the test.

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Specifications

DC VOLTS (Maximum Measurement: 600V)

400mV ..... ± 0.5% of Reading, ±4 in Last Digit
4V – 40V – 400V ..... ± 0.8% of Reading, ±4 in Last Digit
600V ..... ± 1.0% of Reading, ±4 in Last Digit

AC VOLTS (600 V RMS Maximum at 50/60Hz, Average responds, RMS calibrated, DC Coupled)

400mV, 40V – 400V – 600V ..... ± 1.2% of Reading, ±5 in Last Digit
4V ..... ± 0.8% of Reading, ±5 in Last Digit

DC CURRENT (Maximum Measurement: 10A)

40mA – 400mA ..... ± 1.2% of Reading, ±4 in Last Digit
4A – 10A ..... ± 1.5% of Reading, ±4 in Last Digit

AC CURRENT (Average responds, RMS calibrated, 10A maximum, DC coupled)

40mA – 400mA ..... ± 1.5% of Reading, ±4 in Last Digit
4A – 10A ..... ± 2.0% of Reading, ±4 in Last Digit

RESISTANCE

400Ω – 4k – 40kΩ; 400kΩ – 4.0MΩ ..... ± 1.2% of Reading, ±4 in Last Digit
40MΩ ..... ± 2.0% of Reading, ±4 in Last Digit

BATTERY TEST

1,5V C/D/AA (150mA ± 10% load current); 1.5V AAA (50mA ±10% load current); 9V Battery (10mA ± 10% load current) ..... ± 5.0% of Reading, ±4 in Last Digit

DIODE MODE

Open Circuit Voltage ..... < 1.6V DC
Test Current ..... 0.8 mA (Typical)

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CONTINUITY BEEPER

Continuity (short) ..... <=80 ±10 Ohms
Open..... >80 ±10 Ohms
Open Circuit..... <1.6 Volts
Short Circuit Current ..... <1.0 mA

GENERAL

Maximum Common Mode Voltage ..... 600V DC or RMS AC
Range Up Detect Value..... Overflow (>4000 Counts)
Range Down Detect Value..... 380 Counts
Power Source ..... 3 × AAA batteries
Operating Temperature ..... 41°F to 104°F (5°C to 40°C)
Storage Temperature ..... -4°F to 104°F (-20°C to 60°C)
Humidity .....
.....Maximum Relative Humidity 80% for temperatures up to 87.8°F (31°C), decreasing linearity to 50% relative humidity at 104°F (40°C)
Pollution Degree..... 2
Altitude..... up to 6561.6 feet (2000m)
Dimensions (H×W×D) ..... 5 $^{9}/_{10}$ × 2 $^{9}/_{10}$ ×1 ½ In. (150 × 74 ×38mm)
Weight ..... Approx. 6 oz (170 g)

Specifications are subject to change and improvement without notice. Actual product may vary from the images found in this document.

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FCC Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult your local ***RadioShack*** store or an experienced radio/TV technician for help.

If you cannot eliminate the interference, the FCC requires that you stop using your equipment. Changes or modifications not expressly approved by ***RadioShack*** may cause interference and void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Limited Warranty

RadioShack warrants this product against defects in materials and workmanship under normal use by the original purchaser for **ninety (90) days** after the date of purchase from a ***RadioShack***-owned store or an authorized ***RadioShack*** franchisee or dealer. ***RADIOSHACK*** MAKES NO OTHER EXPRESS WARRANTIES.

This warranty does not cover: (a) damage or failure caused by or attributable to abuse, misuse, failure to follow instructions, improper installation or maintenance, alteration, accident, Acts of God (such as floods or lightning), or excess voltage or current; (b) improper or incorrectly performed repairs by persons who are not a ***RadioShack*** Authorized Service Facility; (c) consumables such as fuses or batteries; (d) ordinary wear and tear or cosmetic

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damage; (e) transportation, shipping or insurance costs; (f) costs of product removal, installation, set-up service, adjustment or reinstallation; and (g) claims by persons other than the original purchaser.

Should a problem occur that is covered by this warranty, take the product and the ***RadioShack*** sales receipt as proof of purchase date to any ***RadioShack*** store in the U.S. ***RadioShack*** will, at its option, unless otherwise provided by law: (a) repair the product without charge for parts and labor; (b) replace the product with the same or a comparable product; or (c) refund the purchase price. All replaced parts and products, and products on which a refund is made, become the property of ***RadioShack***. New or reconditioned parts and products may be used in the performance of warranty service. Repaired or replaced parts and products are warranted for the remainder of the original warranty period. You will be charged for repair or replacement of the product made after the expiration of the warranty period.

RADIOSHACK EXPRESSLY DISCLAIMS ALL WARRANTIES AND CONDITIONS NOT STATED IN THIS LIMITED WARRANTY. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY LAW, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND, IF APPLICABLE, THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, SHALL EXPIRE ON THE EXPIRATION OF THE STATED WARRANTY PERIOD.

EXCEPT AS DESCRIBED ABOVE, ***RADIOSHACK*** SHALL HAVE NO LIABILITY OR RESPONSIBILITY TO THE PURCHASER OF THE PRODUCT OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY, LOSS OR DAMAGE CAUSED DIRECTLY OR INDIRECTLY BY USE OR PERFORMANCE OF THE PRODUCT OR ARISING OUT OF ANY BREACH OF THIS WARRANTY, INCLUDING, BUT NOT LIMITED TO, ANY DAMAGES RESULTING FROM INCONVENIENCE AND ANY LOSS OF TIME, DATA, PROPERTY, REVENUE, OR PROFIT AND ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EVEN IF ***RADIOSHACK*** HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. You may contact ***RadioShack*** at:

RadioShack Customer Relations
300 RadioShack Circle, Fort Worth, TX 76102 04/08

www.RadioShack.com

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